REMARKS

Claims 1-10 and 12-19 are pending. Claims 11 and 20 have been canceled without prejudice to or disclaimer of the subject matter recited therein. Claims 1, 3, 6 and 12 have been amended. Applicants respectfully request reconsideration of the application in response to the non-final Office Action.

Allowable Subject Matter

Claims 4, 5, 13 and 14 have been objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicants gratefully acknowledge the indication of allowable subject matter with respect to claims 4, 5, 13 and 14.

Claim Rejections – 35 U.S.C. §103(a)

Claims 1-3, 6-12 and 15-20 have been rejected under 35 U.S.C. §103(a) for allegedly being unpatentable over U.S. Patent No. 6,944,319 to Huang et al. ("Huang") in view of "Example-Based Learning for View-Based Human Face Detection" to Sung at al. ("Sung"). Applicants respectfully traverse the rejection for at least the following reasons.

Claim 1, as amended, recites a method of detecting a face using a pattern classifier comprising the steps of:

> (a) receiving a plurality of face images and a plurality of near-face images and extracting a plurality of face basis vectors expressing the face images and a plurality of near-face basis vectors expressing the near-face images;

(b) extracting face feature vectors and near-face feature vectors by projecting the face images the near-face images upon the face and near-face basis vectors;

(c) classifying the face feature vectors and the near-face feature vectors into a plurality of predetermined sub-classes;

(d) training a plurality of pattern classifiers that correspond to the plurality of predetermined sub-classes, wherein the pattern classifier corresponding to a certain sub-class is trained using the face feature vectors and near-face feature vectors, which are included in the sub-class; and

(e) extracting a feature vector of an image, which is input for face detection, applying the feature vector of the input image to only one pattern classifier of the plurality of pattern classifiers, wherein the one pattern classifier corresponds to the sub-class including the feature vector of the input image, and determining whether the input image is a face image using the pattern classifier.

Applicants submit that neither Huang nor Sung, either alone or in combination, teaches or suggests all of the features of independent claim 1, as amended. In particular, neither Huang nor Sung teaches or suggests "applying the feature vector of the input image to only one pattern classifier of the plurality of pattern classifiers, wherein the one pattern classifier corresponds to the sub-class including the feature vector of the input image, and determining whether the input image is a face image using the pattern classifier," as recited in claim 1.

For example, the specification the instant application describes that, in one embodiment, face and non-face feature vectors are classified into M predetermined sub-classes based on Euclidean distance (e.g., vectors which are close to one in other in terms of Euclidean distance belong to the same sub-class). (See, Specification at page 8, lines 21-31 and page 9, lines 1-8). The specification further describes training support vector machines (SVMs) numbered 1 though M, which correspond to the M pre-determined sub-classes, using the face and near-face feature vectors belonging to respective predetermined sub-classes, and also

describes applying a feature vector of an input image to one of the SVMs, which corresponds to the sub-class that includes the feature vector of the input image, to determine whether a pattern shown in the input image is a face. (See, Specification at 5, lines 19-21, page 9, lines 9-11, and page 10, lines 7-14).

Huang, on the other hand, teaches using a neural network ensemble to identify persons and face poses depicted in input images. (See, Huang at col. 13, lines 12-37). In Huang, a set of PCA coefficient vectors representing an extracted input face image is applied to a set of separately trained neural networks, where each neural network in the set is associated with a particular pose range group, and the set of PCA coefficient vectors are generated by multiplying a dimensional column vector (DCV) for the extracted image by previously calculated basis vectors associated with the different pose range groups. (Huang at col. 13, lines 17-31). Each vector in the set of PCA coefficient vectors is applied to a respective face recognition neural network associated with that vector's particular pose range group. (Huang at col. 13, lines 28-31). Outputs from the set of separately trained neural networks are then applied to a fusing neural network to produce one output that identifies a person and a pose associated with an input image face region. (Huang at col. 13, lines 32-37). Thus, in Huang, all of the separately trained neural networks associated with the different pose range groups are used in identifying a person and a pose associated with the input image, as opposed to "only one pattern classifier of the plurality of pattern classifiers, wherein the one pattern classifier corresponds to the sub-class including the feature vector of the input image," as recited in claim 1.

Further, Applicants submit that Sung does not supply, and is not purported to supply, the teachings missing from Huang. For example, Sung describes using a

multilayer perceptron (MLP) net classifier to identify "face" window patterns from "nonface window patterns." (See, Sung at pages 45, Section 5). In particular, Sung describes training the MLP net classifier to combine a plurality of distance measurements between an input window pattern and twelve model clusters, including six face model clusters and six non-face model clusters, into a single "similarity" measure that can be thresholded to determine positive matches. (See, Sung at page 46, Section 5.2). Thus, Sung's approach for identifying a "face" window pattern is different from "applying the feature vector of the input image to only one pattern classifier of the plurality of pattern classifiers, wherein the one pattern classifier corresponds to the sub-class including the feature vector of the input image, and determining whether the input image is a face image using the pattern classifier," as recited in claim 1.

Accordingly, Applicants submit that independent claim 1 is patentable over Huang and Sung, and respectfully request that the rejection under 35 U.S.C. §103(a) of claim 1, and of claims 2, 3 and 6-10, which depend therefrom, be withdrawn. Similarly, for reasons analogous to those presented for claim 1, Applicants submit that independent claim 12, as amended, is also patentable over Huang and Sung, and respectfully request that the rejection under 35 U.S.C. §103(a) of claim 12, and of claims 15-19, which depend therefrom, be withdrawn.

Claims 11 and 20 have been canceled, thereby rendering the rejection of claims 11 and 20 under 35 U.S.C. §103(a) over Huang in view of Sung moot.

Conclusion

It is believed that this Response and Amendment does not require additional fees. However, if additional fees are required for any reason, please charge Deposit Account No. 02-4800 the necessary amount.

In the event that there are any questions concerning this paper, or the application in general, the Examiner is respectfully urged to telephone Applicants' undersigned representative so that prosecution of the application may be expedited.

Respectfully submitted,

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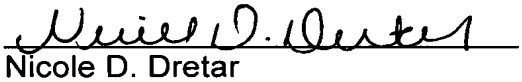
By: 
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